

04. Bhilai Steel Plant — Bhilai
05. Indian Iron & Steel Company — Burnpur
06. Tata Iron & Steel Company — Jamshedpur
07. Vishakhapatnam Steel Plant — Vishakhapatnam

The steel plants have spent over Rs. 2,000 crores for pollution control measures. In pursuance of standards notified under the Environment (Protection) Act, the steel plants having coke ovens are required to improve emission control facilities by 2001.

Disaster Warning Centres

*292. SHRI RAMACHANDRA KHUNTIA: Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

- (a) the location of each of the disaster warning centres functioning presently in the country;
- (b) whether Government propose to set some more such centres;
- (c) if so, the sites selected therefor; and
- (d) the details of the proposal to seek technical know-how and equipments from other countries?

THE MINISTER OF SCIENCE AND TECHNOLOGY (DR. MURLI MANOHAR JOSHI): (a) to (c) The Indian sub-continent is affected by different natural disasters like cyclones, floods, avalanches, earthquakes and landslides. Some of these disasters like floods, cyclones and avalanches are amenable to prediction/forecast. Accordingly, warning centres have been set up by the concerned agencies as per the following details:—

	Location	Agency
(1) Cyclones	Calcutta	IMD, DST
	Bhubaneshwar	
	Visakhapatnam	
	Chennai	
	Mumbai	
	Ahmedabad	

	Location	Agency
(2)	Snow Avalanches Srinagar, Manali Chandigarh	SASE, Ministry of Defence
(3)	Floods As per details given in the Annexure [See Appendix 190, An- nexure No. 31]	CWC, Minister of Wa- ter Resources

(d) During the 9th Plan Period the entire Cyclone Warning System is to be enhanced by induction of latest state-of-the-art technologies. The existing network of 10 radars are being replaced by Doppler Radars in a phased manner and High Wind Speed Recorders will be installed at 10 stations covering east and west coasts of India. These instruments will be procured from other countries by inviting global tenders.

As regard floods, details of the new flood forecasting and warning centres approved for being set up are given in the enclosed statement-I (See below). Many proposals for modernisation and introduction of new technologies have been taken up which involve cooperation with international agencies in respect of which the details are given in Statement-II.

Statement-I

New Forecasting Sites Proposed

I. Brahmaputra Barak Basin Organisation

(a)	River Siang (Dehang)	
1	Passighat	FS
	Rivers in Tripura	
(b)	River Juri	
2	Dharmanagar	FS
(c)	River Dhalai	
3	Kamalpur	FS
(d)	River Khowai	
4	Khowai	FS
(e)	River Howrah	
5	Agartala	FS

	(f) River Gumti	
6	Udaipur	FS
	(g) River Kalyani	
7	Alipurdoar	FS
	(h) Mujani	
II	Krishna & Godavari Organisation.	
	(a) Rivers Munneru	
8	Polampalli (Reservoir)	FS
	(b) River Savitri	
9	Mahad (H.O. Site)	FS
III	Lower Ganga Basin Organisation Tributaries of Ganga (North Bihar)	
	(a) River Gandak	
10	Triveni	FS
11	Dumarighat	FS
12	Piprasi	FS
	(b) River Bagmati	
13	Dheng Bridge	FS
14	Badlaghat	FS
	(c) River Kamla	
15	Jainagar	FS
16	Darjia	FS
	(d) River Kosi	
17	Birpur	FS
	(e) R. Mahananda	
18	Taibpur	FS
	(f) River Butahi	
19	Nirmali	FS
	(g) R. Burhi Gandak	
20	N.H. Bridge (Sugali)	FS
	(h) River North Koel	
21	Mohammadgunge	FS
	(i) River Punpun	
22	Hamidnagar	FS

IV Cauveri & Southern Rivers Organisation

(a) River Meenachil

23 Kidangoor

FS

Statement-II

Status note on modernisation of flood forecasting works of CWC

Since begining, Flood Forecasting activity has undergone significant change through constant efforts of modernization to make the forecasting work more efficient and to increase the warning time. To achieve this objective, the techniques of observation of Hydrological and hydro-meteorological data and their transmission to the forecasting centres has been constantly under review and the system is being modernized through plan scheme.

In order to improve the warning time, particularly for flashy rivers and for more important locations/reaches suitable schemes were taken up. A programme of modernization of flood forecasting and warning service was taken up for Yamuna basin involving installation of sophisticated equipment for collection, transmission and storage of real time hydrological/hydro meteorological data in the eighties. This work was initiated under a UNDP pilot project. Under its phase I programme, electromagnetic sensors for automatic collection of water level, rainfall and temperature data were installed at the existing gauge discharge stations in the Upper Yamuna basin above Delhi. Besides all the existing rain gauge stations were also provided with automatic sensors. A relay type VHF transmission network was set up for transmission of data to the Master Station at Delhi. Subsequently, under phase II, a parallel VHF satellite system for transmission of data from the same sensors was also set up.

A computer based inflow forecasting system for Damodar Valley Reservoirs which was taken up under the Danish Hydraulic (DHI)/ Central Water Commission collaboration project. Computer based catchment models developed in DHI were transferred for adoption for DVC system after suitable modification, for formulation of both inflow and stage forecasts. Results obtained from this model are quite

satisfactory and computer based forecasts are being issued regularly on operational basis for two dams and a down stream barrage in the basin. This has provided better efficiency in reservoir regulation during monsoon for flood moderation.

CWC-DHI collaboration scheme to transfer technology of mathematical modeling developed in the Danish Hydraulic Institute was also extended to the Godavari Basin. MIKE-II Model, an updated version of an NAM-SYSTEM-II F Model, is being utilized to develop the forecasting systems for the Godavari. Presently, the model is being further refined under Indo-German collaboration using information through remote sensing technique as additional input so as to increase the warning time and accuracy of forecasts.

The latest modernisation effort was the completion of the scheme for modernizing inflow forecasting system in Mahanadi and Chambal Basin, for Dam Safety Assurance under the World Bank aided scheme. The scheme was completed in September, 1999.

The main considerations were to improve the quality and accuracy of the forecasts and increase the warning time of the forecast to make it more meaningful. The works proposed were:—

- automated data collection and transmission system through sensors and DCPS;
- use of latest technology for communication through satellite;
- improvement of the forecast formulation techniques.

Under the scheme the Headquarters are strengthened with modern equipment. Field units are provided with sensors and DCP equipments. Telemetry System is established in Mahanadi and Chambal basins including installation of VSAT facilities at selected locations. Application of latest computer based mathematical models are planned for forecast formulation. Necessary infrastructure facilities for the analysis of flood scenarios have been created.